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May 14, 2010

VIA FEDERAL EXPRESS

Peter Briggs
Chief, Permits Section
New York State Department of
Environmental Conservation
Division of Mineral Resources
Bureau of Oil & Gas Regulation
625 Broadway, 3rd Floor
Albany, NY 12233-6500

Re: *Finger Lakes LPG Storage, LLC, Schuyler County*
Revised Reservoir Suitability Report and Response to DEC
Notice of Incomplete Application

Dear Peter:

As you are aware, our client, Finger Lakes LPG Storage, LLC ("Finger Lakes") is proposing the construction of a multi-cycle LPG storage system with a pipeline connection and rail and truck load/unload racks in the Town of Reading, Schuyler County ("the Project"). We are in receipt of the Department's January 11, 2010 Notice of Incomplete Application ("NOIA") for our Underground Storage Permit Application.

On behalf of Finger Lakes and in response to the NOIA, we submit an original and one (1) copy of the following:

1. Revised Reservoir Suitability Report with Exhibits 1-26; and
2. Response to January 11, 2010 NOIA with Exhibits A-F.

Peter Briggs
May 14, 2010
Page 2

If you have any questions, please feel free to contact me. Thank you.

Sincerely,

BOND, SCHOENECK & KING, PLLC



Kevin M. Bernstein

cc: (w/enclosures)

Jennifer Maglienti, Esq., NYSDEC	<i>via First Class Mail</i>
Linda Collart, NYSDEC	<i>via Federal Express</i>
William Glynn, NYSDEC	<i>via First Class Mail</i>
Roger McDonough, NYSDEC	<i>via Federal Express</i>
William Kelly, NYSGS	<i>via Federal Express</i>
William Moler, Finger Lakes	<i>via First Class Mail</i>
Barry Cigich, Finger Lakes	<i>via First Class Mail</i>
Barry Moon, Finger Lakes	<i>via First Class Mail</i>
Leonard Dionisio, Finger Lakes	<i>via First Class Mail</i>
John Istvan, IGC	<i>via First Class Mail</i>

Finger Lakes LPG Storage, LLC

Finger Lakes LPG Storage Facility
Reading, New York

Response to DEC January 11, 2010 Notice of
Incomplete Application

Filed: May 14, 2010

**Response of Finger Lakes LPG Storage, LLC to DEC's January 11, 2010
Notice of Incomplete Application ("NOIA")**

Finger Lakes LPG Storage, LLC, Schuyler County

3. **Transfer of Well Plugging Responsibilities** - Approval of such transfer requires properly completed request for transfer forms, followed by compliance inspection of the wells by Regional staff and verification of financial security.

DEC Comment: All unplugged wells in Finger Lakes' Galleries 1 and 2 currently registered with other well owners [i.e., US Salt LLC and Seneca Lake Storage, Inc. ("SLSI")] must be transferred prior to Finger Lakes performing any proposed well work that requires a permit in Finger Lakes' name.

Finger Lakes Response: *An application to transfer the wells in Galleries 1 and 2 to Finger Lakes is being provided with this Response as **Exhibit A**.*

4. **Full Environmental Assessment Form** - In contrast to the individual Environmental Assessment Form required with each drilling permit application, the Full Environmental Assessment Form ("EAF") is required to address the whole storage project, including any compressor site, any proposed lateral pipelines to power plants or transmission lines, and any proposed discharges. The Full EAF will be used to identify:

- a. any need for additional Department permits including those that address brine handling and discharge/disposal.

DEC Comment: Finger Lakes provided a Full EAF with its storage application received on October 13, 2009. The following corrections must be made, and a revised form submitted. However, because this NOIA is limited to Division of Mineral Resources' issues, Finger Lakes should coordinate its revisions and submission of the revised EAF with any comments received from the Region 8 Avon Division of Environmental Permits office, and submit only one revised form to the Department.

Page 1 — The "Name of Lead Agency" must reflect the Commissioner's Lead Agency Decision when reached.

Page 2 — The address of the applicant must be corrected to reflect Finger Lakes' Organizational Report provided with the storage application.

Page 5 — The total amount of salt that will be removed from the site due to operational solution mining over the projected life of the project must be provided including a notation of the life of the project in years.

Page 8 — Additional approvals in the form of well transfers, well drilling permits and well plugging permits associated with the project will be required by the NYSDEC.

Page 10— The form appears to be signed by Michael Armstrong, Director Engineering. Mr. Armstrong is not listed in Box 7 of Finger Lakes' Organizational Report provided with the storage application, and therefore is not authorized to sign submittals to the Department.

Please have a person listed in Box 7 or Kevin Bernstein (project-specific authorization granted by Finger Lakes on October 20, 2009) sign the revised EAF.

Finger Lakes Response: *The changes requested on Pages 1, 2 and 8 have been made to the EAF. With regard to the information DEC requests be added on Page 5 of 21, Part 1, Section B(2), the EAF now refers to an attachment which provides this information, which will also be incorporated into the revised Reservoir Suitability Report. The revised EAF is now signed by Kevin Bernstein and is attached to this Response as Exhibit B. It was also submitted in connection with our response of April 27, 2010 to DEC's letter of March 19, 2010 from Roger McDonough of Region 8.*

5. **Map(s)** - Please prepare a map(s) at a minimum scale of 1" = 400' and include the following items. Submit as many separate maps as necessary to legibly depict the requested information.

DEC Comment: Generally speaking, the facility map (4/14/09, last updated 7/9/09) provided with the Finger Lakes storage application is deficient in many of the same ways as were maps provided by Inergy Midstream, LLC ("Inergy") for its other LPG storage application at Savona. The deficiencies for the Savona application were previously communicated by the Department to Inergy although they apparently were not considered when preparing the Finger Lakes application map. Most remarkably, the proposed ultimate cavern outlines and remaining pillar thicknesses at the end of the life of the project are absent from Finger Lakes' map. Specific map deficiencies are noted below and must be corrected, and a revised map or maps submitted.

- a. Location, total depth, well type, well status and API well identification number of all wells listed in the Well Status and Condition Report described in item 9 below.

DEC Comment: Finger Lakes must supplement its map to include the requested information for all wells listed in the Well Status and Condition Report as described and required in below Item 9.

Finger Lakes Response: *The mapping effort has been revised and a revised map (and related cross-sections) is included with the Revised Reservoir Suitability Report.*

The map and cross-sections, in total, show each gallery and cavern outlines and pillar thicknesses. In addition, all requested information (depth, status, and API number) about each well in each gallery, along with information (including distances) on wells immediately adjacent to the storage area are included on the maps. In addition, the gallery map shows the new well location to be drilled in Gallery 1.

- b. Location of all existing and proposed wells within and immediately adjacent to the storage area.

DEC Comment: Finger Lakes must supplement its map to include all wells listed in the Well Status and Condition Report as described and required in Item 9, including showing existing and plugged wells and gallery outlines in the south field located south of proposed LPG Gallery 2. The map must also show the locations of all proposed wells in Galleries 1 and 2.

Finger Lakes Response: See Response to Comment in 5a. above. The distances from the wells in Galleries 1 and 2 to the next closest cavern to the south are included in the revised map being provided with the revised Reservoir Suitability Report.

- c. Plan view of the proposed reservoir boundary (i.e., existing and proposed ultimate cavern outlines which take into account directional surveys for wells). Clearly label each cavern to denote its current status, current use and proposed use under the requested permit. Include distance, in feet, between proposed ultimate cavern outlines and/or other existing caverns.

DEC Comment: Finger Lakes must supplement its map to include all requested information as described above. Wells in communication must be shown as such on the plan view. Presently, Finger Lakes' map provided with its storage application shows individual caverns in Gallery 1. Interconnections must be shown and a single gallery outline provided for both existing and proposed ultimate conditions for Galleries 1 and 2. The map must include a notation of the method by which the existing outlines were determined (e.g., sonar survey, production records). Each gallery's length and span at proposed ultimate capacity must be shown on the map. The distance, in feet, between proposed ultimate cavern outlines and other caverns/galleries in the field must be shown (i.e., remaining pillar thicknesses). These determinations must take into account any additional solution mining that may occur as a result of brine production at the US Salt LLC operation. For proposed storage Galleries 1 and 2, all current and past sonar surveys (outermost outline) must be included on the plan view. The Department has previously run sonar survey information (excluding the 2009 surveys) in its files as follows: Well Nos. 34, 43 & 44 - 1997, 1999, 2001, 2002, 2004 and Well No. 30 - 1997. Finger Lakes may submit as many maps as needed to clearly display the requested information, however; all sonar survey outlines should be shown and appropriately labeled on a single map.

For the portion of the cavern outline currently shown on the map due west of Well No. 34, it is the Department's understanding that this linear feature would be re-evaluated prior to submission of this storage application because the sonar for Well No. 34 does not show such a feature. Rather, the linear feature shown is from Well No. 44's sonar. This issue with the map for the facility was discussed during our field visit in May 2009. Please explain why the linear feature was retained or correct this portion of the cavern outline.

In addition, for wells with directional surveys, wellhead and production casing shoe locations must be clarified on Finger Lakes' map or maps. In addition to any symbol used to denote casing shoe locations, wellhead symbols (e.g., 33, 43, 34, 44, new wells) must also be included in a legend.

The relative closeness of the gallery (Well Nos. 18, 55 [sic]¹, 57, aka International Gallery 10) immediately to the north of proposed storage Gallery 1 is of potential concern to the Department. For each of the three wells identified in the gallery, provide a well diagram showing the depth of top of salt, existing casing, mechanical plugs and cement. Please provide any additional information Finger Lakes may have to show that no interconnection between the noted galleries currently exists or will be formed during operation of the proposed project or if such a connection is made, that International Gallery 10 would adequately contain LPG stored in Gallery 1. Inadvertent communication between Finger Lakes Gallery 1 and International Gallery 10 could provide a possible route of escape for stored product at some future date after Gallery 1 is activated. In addition, do directional surveys exist for the identified wells (Well Nos. 18, 55, 57)? Finger Lakes facility map shows a current pillar thickness between the galleries of approximately 70 feet. Is any pressure testing of International Gallery 10 contemplated? The Department may require re-entry and hydrostatic pressure testing of International Gallery 10 (along with full complement of directional survey, sonar survey, nitrogen/brine interface MIT on re-entered well) upon receipt and evaluation of Finger Lakes' response to this NOIA.

Finger Lakes Response: *The map has been revised to show individual caverns within Gallery 1 and the point(s) of interconnection (shown as a pressure connection on the map), all of which should be considered a single gallery outline. The cross section maps indicate the basis for the shape (sonar surveys) of each gallery and all of the caverns within Gallery 1. The maps show distances between the proposed Finger Lakes' galleries as they currently exist and at ultimate diameter² and other wells immediately adjacent (more specifically, wells 18, 29, 52, and 57). For Gallery 2, the [REDACTED]*

*[REDACTED] For information purposes, a list of sonars for each well within Galleries 1 and 2 and the other wells in the immediate vicinity is attached to this Response as **Exhibit C**.*

The [REDACTED] is discussed in Section 6.4 of revised Reservoir Suitability Report.

*Finally, in response to the Department's request, we asked SOCON Sonar Well Services to provide its opinion about the existence of a [REDACTED] based on a [REDACTED] and to give their interpretation of the [REDACTED]. Attached as **Exhibit D** is SOCON's letter of April 5, 2010.*

- d. All faults or other structural or stratigraphic features depicted on the cross-sections described in item 6a below.

DEC Comment: See Department responses to below Items 6a and 6b.

Finger Lakes Response: *No structural or stratigraphic "features" or anomalies have been found.*

¹ The reference to well 55 is incorrect; the reference in the comment should be to well 52.

² [REDACTED]

- f. Notation of the applicant's surface and mineral rights within the vicinity of the proposed storage area.

DEC Comment: Such notation must be included with the applicant's storage rights affidavit required in below Item 10.

Finger Lakes Response: Ownership information is now included on the map. In addition, as noted below, a storage rights affidavit, storage rights tabulation, and storage rights map is attached as **Exhibit E**.

6. **Reservoir Suitability Report** - This report must document suitability of the reservoir for storage. The report must include a cavern development plan & geomechanical (including finite element analysis) study including and analyzing, but not necessarily limited to, items listed below. Note that the geomechanical study must use supportable baseline cavern information and a justifiable projection for future cavern growth – existing cavern size(s) and shape(s) must be based on reliable information such as historical cavern development records and recent sonar surveys.

DEC Comment: On pages 9 & 10 of the storage application, Finger Lakes indicates that it does not intend to perform any cavern/gallery specific Finite Element Analysis ("FEA") [or Finite Difference Analysis ("FDA")] for proposed LPG storage Galleries 1 and 2, and instead proposes to rely on SLSI's 2002 natural gas storage analysis for Gallery 2. This proposal is not acceptable to the Department, and is fundamentally flawed because the 2002 analysis was performed on a no-growth natural gas storage cavern/gallery. We concur that a natural gas cavern analysis is typically more rigorous than a LPG analysis because of the operating range associated with such operations but Finger Lakes has stated that it anticipates its galleries will grow at a rate of approximately 1-2% annually due to operational solution mining. The Department estimates the caverns will double in capacity in approximately 35 years using an annual operational solution mining growth rate of 2%. We agree with Finger Lakes that future sonar surveying may reveal some cavern capacity being masked by bulking of insolubles forming the rubble pile. However, from a structural perspective, the storage galleries will not be static and will grow over time. Finger Lakes must take this growth into account in its analysis and evaluation of the caverns, and demonstrate stability and containment of LPG over the projected life of the project. Gallery interaction between proposed storage Galleries 1 and 2 must be analyzed over the entire projected life of the facility. A prediction of the time required for each gallery to grow from its existing capacity to proposed ultimate capacity based on individual cavern characteristics and proposed operation of individual wells (i.e., injection, withdrawal) must be included in the required geomechanical analysis. Modeled dimensions must be provided in the required geomechanical analysis. Minimum and maximum operating pressures, including MIT pressures, must be stated and considered in the required geomechanical analysis. A prediction of total subsidence at the end of the operating life of the project must be included.

In addition, because of the close proximity of New York State Electric and Gas' ("NYSEG") existing natural gas storage operation, the required geomechanical analysis

and report must include a gallery interaction study, under all existing and proposed operating and testing conditions, which analyzes currently permitted operations at NYSEG's existing storage cavern and operation of Finger Lakes' proposed LPG storage galleries over the proposed life of the Finger Lakes' facility. A copy of NYSEG's 1995 Underground Storage Permit with allowable operating pressures was previously provided to the applicant. A copy of the gallery interaction study must be provided to Mr. Mark Cole of NYSEG at the same time the interaction study is provided to the Department, and proof of delivery of such to NYSEG must be provided to the Department.

Finger Lakes Response: *A Finite Element Analysis ("FEA") model was prepared by Dr. Kittitep Fuenkajorn, Associate Professor of Engineering at Suranaree University of Technology, Nakhon Ratchasima (Khorat), Thailand. Dr. Fuenkajorn performed the exact same type of FEA for the Amoco Silver Springs LPG storage project and for the Underground Storage Permit Modification for Inergy Savona.*

The FEA was performed to assess the stability conditions of the 34/44 LPG storage gallery, gallery 10 and caverns 33 and 43 at the Finger Lakes facility, Watkins Glen, New York. Laboratory test data from related projects obtained by RESPEC Inc. (included as Exhibits to the revised Reservoir Suitability Report) were used to determine the mechanical and rheological properties of the Syracuse salt and the overburden rocks.

Two finite element models were developed to represent a vertical and a horizontal cross-section of the studied galleries and caverns in relation to the site geology. Conservative cavern geometry and boundary conditions were then imposed. The analyses were made to simulate the mechanical behavior of the surrounding salt under three extreme internal pressures through the next 50 years. These cases include (1) constant hydrostatic pressure of brine, (2) the mechanical integrity test (MIT) hydrostatic pressure (about 80% of the in-situ stress at casing shoe), and (3) the minimum LPG pressure with zero wellhead pressure. The study results are summarized as follows:

- (1) The inter-cavern pillars between caverns 33 and 43, 34/44 LPG gallery and gallery 10 will be mechanically stable under the minimum LPG storage pressure of 1,197 psi at the casing shoe for the next 50 years.*
- (2) The inter-cavern pillars will be mechanically stable under the MIT hydrostatic pressure of 1,680 psi at the casing shoe for the next 50 years. The MIT pressure is lower than the predicted pillar stresses.*
- (3) Leakage or communication between galleries and caverns under the MIT and minimum pressures is very unlikely.*
- (4) The impact of the pressure cycle is very small due to the small difference between the proposed magnitudes of the maximum and minimum storage pressures of the LPG.*
- (5) The salt pillars have been subjected to large shear strains during brine storage/production. These strains are however significantly reduced by the*

increase of the confining pressures in the salt pillars when the caverns/galleries are under MIT pressure and LPG storage.

- (6) Certain conservative assumptions were made relating to the pressure, location and size of cavern associated with Gallery 10. Inability to access the gallery for sonar due to well conditions necessitated the use of these worst case assumptions. Although the results reflect integrity and lack of failure in all cases using these conservative assumptions, these are not necessarily representative of actual conditions present. For further assurance and maintenance of integrity in Finger Lakes Gallery 1, well 44 will be utilized as a monitoring well and no solution mining will occur in the direction of well 44.*
- (7) Both well 58 (far away and not on FEA map), and NYSEG³ Galleries 1 (natural gas storage service), and 2 are also too far away to have any affect on the Finger Lakes (FL) LPG storage caverns.*
- (8) Well 33 will not increase in diameter if and when it is put into LPG storage service since any 30% increase in solution mining by undersaturated brine product displacement will take place above the existing maximum diameter.*
- (9) Wells 43 and 44 will be monitoring wells and will not be solution mined (i.e., those wells have no affect on the modeling).*
 - a. Geologic cross-sections of the area shown on the map listed in item 5 showing lithologies, storage wells (including casing strings and setting depths) and overlying and underlying formations, and vertical profiles of the existing and ultimate caverns including all prior sonar surveys. These cross-sections must also depict any faults or other structural or stratigraphic features that affect either continuity and extent of the formations shown or effectiveness of containment of gas in the storage reservoir.

DEC Comment: Cross-sections of Galleries 1 and 2 are included in Finger Lakes' application as Exhibits 5 and 6 respectively. Some additional cross-sections for Gallery 2 are included in Exhibit 10. However, these cross-sections do not satisfy the Department's informational requirements as previously requested. Finger Lakes may add information to the previously submitted cross-sections or provide focused cross-sections of the proposed storage caverns with the required additional information. All interconnections through rubble piles must be identified on the cross-sections to show communication, where appropriate, within each gallery and storage capacity. A single gallery outline must be provided for both existing and proposed ultimate conditions for Galleries 1 and 2. For Gallery 1, distinct salt and "rock" units and cavern development within such must be identified similar to what was already provided for Gallery 2 (Exhibit 6). However, for both Gallery 1 and 2 cross-sections, the standardized salt unit naming convention ("D, E, F," sequence starts at bottom, see Figure 3-1 of Exhibit 10

³ As the Department is aware, Inergy Midstream, LLC has entered into an agreement to acquire NYSEG's Seneca Storage Facility.

and “Stratigraphy of the Upper Silurian Salina Group, New York, Pennsylvania, Ohio, Ontario,” Map and Chart Series Number 12, New York State Museum and Science Service, Rickard, 1969.) must be used instead of naming units numerically from top to bottom. The cross-section must include a notation of the method by which the existing outline was determined (e.g., sonar survey, production records). For the purpose of this application (and permit, if and when issued), all water-filled capacity, including any in rubble pile, is considered potential product storage capacity regardless of how deep Finger Lakes intends to set its brine strings. All current and past sonar surveys (outermost outline) must be included on the cross-sections to facilitate identification of rubble-filled portions of each gallery and cavern growth characteristics. Finger Lakes may submit as many cross-sections as needed to clearly display the requested information, however; all sonar survey outlines should be shown and appropriately labeled on a single cross-section. The Department has previously run sonar survey information (excluding the 2009 surveys) in its files as follows: Well Nos. 34, 43 & 44 - 1997, 1999, 2001, 2002, 2004 and Well No. 30 - 1997. The Department does not have the “8/16/78 Sonar Survey” noted and shown on Exhibit 5 - please provide a copy of the referenced 1978 sonar survey. The Department does not have the “July 1978” sonar survey for Well No. 30 noted on page 6 of Exhibit 10 - please provide a copy of the survey. All requested cross-sections must correspond to the map or maps requested in above Item 5.

***Finger Lakes Response:** The Camillus shale directly overlies the Syracuse salt sequence. This shale sequence is approximately 80 feet thick across the Finger Lakes LPG Storage area. As illustrated on the Camillus Shale Isopach map included with the revised Reservoir Suitability Report, the thickness of the Camillus Shale varies from 78 to 82 feet thick across the brine field. The fact that the thickness of the shale is so uniform confirms the interpretation that the Camillus shale cap rock has not been compromised by faulting. If faulting had occurred, significant shortening by normal faults or lengthening in response to reverse faulting would be reflected in the thickness of the Camillus shale.*

In addition, a structure map included with the revised Reservoir Suitability Report has been constructed on the base of the Camillus shale reflecting approximately 30 feet of dip to the west across the brine field. The consistent dip represented on the structure map reinforces the interpretation that no faulting extends into the Camillus shale cap rock.

Two sets of cross-sections included with the revised Reservoir Suitability Report, one North-to-South and the other West-to-East, illustrate the absence of faulting and the uniformity of the Camillus shale across the Finger Lakes LPG Storage area.⁴ The cross-sections illustrate the distinct salt and “rock” units using the Rickard standardized salt unit naming convention. The cross-sections show all sonar survey outlines (appropriately labeled) and any interconnections with other wells/caverns (e.g., in Gallery 1).

⁴ The location of the cross-sections (A-A' and B-B') are shown in the gallery maps included with the revised Reservoir Suitability Report.

The reference to an 8/16/78 sonar for well 33 was in error and is not now reflected on the updated cross-sections submitted with the revised Reservoir Suitability Report.

- b. Discussion of the information illustrated on the cross-sections described above. Any zones or planes of weakness referenced in other published reports (e.g., Jacoby) potentially affecting the suitability of the reservoir for storage must be documented and explained in the Reservoir Suitability Report.

DEC Comment: Discussion of the project's regional and local geology and structural features is included on pages 1, 2, 3, 6, 7, 8 and pages 11 through 15 of Exhibit 10. On page 3, Finger Lakes states "The overlying sediments are characterized by broad, gentle east-west synclines and anticlines with axes generally paralleling the sharp folds of the underlying evaporates." Finger Lakes' discussion on page 8 of its application includes statements from Jacoby and Dellwig that "The structure contour map on top of the salt gives no indication of the faults breaking up into the overlying sediments" and that the "zones or planes of weakness" referenced in the same paper are confined to the salt section. For proposed storage Gallery 1, while general statements are made regarding the continuity of the Camillus Shale, it is unclear from the discussion in the application if Finger Lakes has performed its own independent analysis and evaluated each well's geophysical logs (along a north-south line running through Gallery 1 from Well No. 18 or 57 to Well No. 31 and an applicant-selected representative east-west line through Gallery 1) to determine if repeat or missing sections occur as an indication of faulting in the caprock overlying the Syracuse salts. Please provide analysis if previously prepared. If such an analysis has not been performed, please do so and provide results. If the analysis shows that faults are present, they must be shown on the cross-sections. The objective of this requirement is to demonstrate the lack of potential pathways for the escape of stored product.

Finger Lakes Response: *The isopach and structure maps referenced in the previous response to 6(a) represent Finger Lakes' independent analysis of the available geophysical data to support the conclusion that there is no faulting in the caprock overlying the Syracuse salts. The maps were prepared by Geologist Leonard Dionisio.*

- c. Discussion of any core test results including caprock and salt properties.

DEC Comment: Addressed by Item 7.3 and Exhibits 8 & 9 of Finger Lakes' storage application. Please explain how the referenced cores correlate to Finger Lakes' proposed Galleries 1 and 2. The caprock and salt properties discussed in Exhibits 8 & 9 should be used in the project-specific geomechanical analysis requested in Item 6.

Finger Lakes Response: *Core testing has been done for well 58, which constitutes Gallery 2 and well 59, which is part of Seneca Storage Gallery 1. From these wells, the caprock and salt properties in the vicinity of the proposed Finger Lakes storage facility can be surmised. Cores were taken of well 58 at the time of drilling (late 1992) and a sample description and core log is attached to the revised Reservoir Suitability Report. Cores were taken of well 59 in late 1995. A description of the coring*

activities at well 59 is attached to the Reservoir Suitability Report. Subsequently, a geomechanical analysis for these two wells was conducted in 1996.

The coring that was performed in wells 58 and 59 for the Seneca Lake natural gas storage project was to determine what the Poissons Ratio, Young's Modulus, and compressive strengths are of the Watkins Glen salt deposit. That is, what were the mechanical properties of the local salt body that had been solution mined for over 100 years. The core and mechanical testing results are based on worst case conditions of the compression and tensile testing process. Core analysis and rock mechanics testing from one or two wells in a salt body are transferrable to other wells/caverns in the same salt body such as was accomplished at Savona for the finite-element analysis/geomechanical study that is being provided to DEC with the Reservoir Suitability Report.

A finite element model has been prepared for Finger Lakes to simulate the worst case in utilizing the caverns in relation to adjacent caverns based on the wall-to-wall distance between caverns. See Section 8 of the revised Reservoir Suitability Report.

The core descriptions for wells 58 and 59 verify much of what Jacoby reported in his papers including the fact that the insoluble fragments and "faults" are all enclosed with recrystallized salt and do not create a situation where an insoluble fall into the cavern means that the developing space must be abandoned.

- e. Existing and proposed total storage capacity (i.e., water-filled capacity) which includes rubble pile capacity, if any, and minimum and maximum operating storage pressures. The underground storage permit for the facility will specify total capacity; any future increase in permitted total capacity, however caused, will require an underground storage modification permit in accordance with ECL §23-1301(5)(b).

DEC Comment: Page 2 of the storage application states that Gallery 1's existing capacity is "close to 5 million barrels" and Gallery 2 "will store 1,000,000 barrels." In addition, no proposed ultimate total storage capacities were provided by Finger Lakes except that Finger Lakes states on page 11 of its application that "The only increase in cavern dimensions will be about 1-2% annually by the displacement of hydrocarbon products with slightly undersaturated brine..."

For each gallery, please restate or state, in more precise terms a) existing total storage capacity (i.e., water-filled capacity) which includes rubble pile capacity, if any, b) proposed ultimate total storage capacity (i.e., water-filled capacity) which includes rubble pile capacity, if any, c) gallery length and span at proposed ultimate capacity, and d) operating storage pressures as follows for each proposed storage well: maximum storage pressure at the wellhead (psig), and minimum and maximum storage pressure gradients measured at the casing shoe (psi/ft) with corresponding casing shoe depth. For each gallery's stated existing and proposed ultimate capacity, explain how determined. Submission of a "Capacity Matrix" as was provided with the Savona LPG application would be one means of providing some of the above requested information.

Finger Lakes Response: Out of the existing sonar determined storage capacity for Gallery 1 (wells 33, 43, 34 and 44) of approximately 5 million barrels, Finger Lakes is requesting authorization to store 1.5 million barrels of product in this Gallery.

Finger Lakes (well 58) seeks authorization to store 600,000 barrels of product (after additional solutioning) in Gallery 2.





Salt caverns in LPG storage remain full of liquid at all times. The fluid pressure in the well and cavern depends on the height of the column of fluid(s) in the well and the weight of the fluid in the column. There are two columns of fluid in the LPG storage well. The well casing is cemented into the rock formations and goes from the surface to a point just above the salt layer, ending at the "casing shoe." A tubing string is hung from the wellhead and passes down through the inside of the cemented production casing, past the casing shoe to near the bottom of the cavern. The tubing is full of either brine or fresh water. The space around the tubing inside the casing is called the annulus. The annulus is filled with brine when the cavern is empty and with LPG when the well is in storage service. Storage is accomplished by pumping LPG down the annulus and displacing brine out from the cavern through the tubing to the surface. Recovery of product is accomplished by pumping brine or water into the tubing and displacing LPG back out of the cavern up the annulus to the surface facilities. The well/cavern system is a closed system.

The pressures at the casing shoe and in the cavern are always controlled by the weight of the column of fluid in the tubing. The pumping pressures are the pressures required to overcome the weight of brine or LPG in their respective columns plus the friction acting against the flow.

Finger Lakes' proposed maximum and minimum operating storage pressure is based on constant LPG or brine pressures in the wells and caverns making up each of the galleries. The wells will be operated in parallel and will all be at the same pressure, either under hydraulic pressure of brine or LPG pressure. On that basis there are no technical reasons why Gallery 1 would not be stable in the future after passing the nitrogen interface MIT since the walls and roof of the cavern/gallery are always fluid supported.

The rock mechanics and finite-element analysis evaluations being provided by Finger Lakes with this application assume a 0.8 psi/foot pressure to the casing seat in their analysis. Finger Lakes hydrostatic testing in proposed Gallery 1 was at 0.8 psi/foot, in excess of the favorable testing performed by Seneca Lake Storage. The Gallery 2 pressure testing was 0.8 psi/foot. Since the salt in the field is similar throughout, Finger Lakes as a prudent operator, will test with nitrogen/brine MIT at 0.75 psi/foot at the casing seats in both new and existing wells in Galleries 1 and 2 before product is injected into those wells.

The maximum and minimum storage gradients at the wellhead and casing shoes will be as follows:

<i>Well</i>	<i>Min Grad</i>	<i>Max Grad</i>
<i>Well 33 – casing seat cemented at 1,975'</i>	<i>.433/.52</i>	
<i>Well 43 – casing seat cemented at 2,117,</i>	<i>.433/.52</i>	
<i>Well 34 – Plugged and Abandoned – 2010'</i>		
<i>Well 44 – casing seat cemented at 2,423'</i>	<i>.433/.52</i>	
<i>Well 58 – casing seat cemented at 2,183'</i>	<i>.433/.52</i>	

These pressures are well below those assumed in the FEA.

- f. Past and current sonar reports and surveys, and schedule for future sonar surveys. Sonar schedules must take into account the cavern development plan. Any other materials including other types of surveys and/or determinations of current cavern size and shape including records of prior cavern development. Directional surveys for wells for determining spatial relationship of caverns.

DEC Comment: Recently run sonars and directional surveys have been provided by Finger Lakes (or its parent Inergy Midstream, LLC). The Department also has some past sonar surveys for some of the subject wells in its files. Finger Lakes must provide a listing of all available sonars so that the Department can verify it already has a copy.

Finger Lakes states that Gallery 1 sonar surveying is complete at this time and that future sonars will be conducted at least every ten years. With regard to Gallery 2, Finger Lakes states that “When the wells for gallery 2 are redrilled or new wells drilled, new sonars will be performed (and periodically thereafter every 10 years). Directional surveys will also be performed when the new wells are drilled.” It is the Department’s understanding that no wells in Gallery 2 will be redrilled (see “Finger Lakes Gallery 2,” page 12 of application). Please clarify.

Finger Lakes Response: *A list of sonars for each well within Galleries 1 and 2 and the other wells immediately adjacent is attached in response to previous comments in this NOLA.*

- h. Proposed safety and emergency shut-down systems for the storage facility. Upon review of items a through h, the Department may require additional geologic and/or engineering analysis to further support the applicant’s proposed operations.

DEC Comment: If and when the storage permit is issued, prior to any injection of storage gas, Finger Lakes must provide two copies of its Emergency Response Manual to the Director of the Bureau of Oil & Gas Regulation in the Department’s Albany office.

Finger Lakes Response: *Prior to any injection of LPG, Finger Lakes will provide two copies of its Emergency Response Manual to the Director of the Bureau of Oil & Gas Regulation in the Department’s Albany office.*

7. **Subsidence monitoring plan.** The subsidence monitoring plan must take into account the cavern development plan.

DEC Comment: Finger Lakes' proposal to continue US Salt's subsidence monitoring schedule of every 5 years for the proposed LPG storage facility is not acceptable because US Salt's five-year program is designed for solution salt mining and not storage of hydrocarbons. Early detection is inherently more critical at hydrocarbon storage facilities. Consistent with existing subsidence monitoring programs at the Savona and Harford Mills LPG storage facilities, if and when the storage permit is issued, subsidence monitoring will be required at least every 2 years at all injection, withdrawal and plugged wells in each gallery. In addition to the storage and plugged wells in Galleries 1 and 2, please identify additional monuments or wells, if any, that will be included in Finger Lakes bi-annual subsidence surveying program when implemented.

Finger Lakes Response: *US Salt has been monitoring the elevations of wellheads and other subsidence monuments for decades and providing a report every 5 years. Experience has shown that as many monuments show a reduction in elevation show an increase in elevation. Much of the changes in elevation are due to the change in the weather from warm to cold. This phenomenon is universal and documented surveys show that there has been no significant subsidence across the field mainly due to the stiffness of the overlying formations.*

At the DEC's request, Finger Lakes will conduct subsidence monitoring at least every two (2) years at all injection, withdrawal, monitoring and plugged wells in each gallery. More specifically, Finger Lakes proposes to conduct bi-annual subsidence monitoring on wells in Gallery 1 (well 33, 34, 43, 44 and FL 1 (when drilled), and Gallery 2 (well 58). Monuments will include Mon 20/42, Mon 20/02, BM 77-1, BM 77-2, BM 77-3 and BM USGS95 which are used by US Salt for their subsidence program.

8. **Mechanical integrity testing ("MIT") plan.** Proposed MIT pressures must be accounted for in the geomechanical analysis.

DEC Comment: On page 13 of its application Finger Lakes states that it will conduct a nitrogen/brine interface MIT at all storage wells prior to first injection of product and thereafter at least every five years. Please state proposed MIT test pressure for each well (Galleries 1 and 2) in psi/ft. Test pressures must be taken into account in the required geomechanical study. In addition, if and when the storage permit is issued and prior to injection of product, Finger Lakes will be required to submit for Department review and approval a summary of test data and a narrative report detailing the results of all MITs.

Finger Lakes Response: *Finger Lakes understands that DEC requires nitrogen interface MIT tests at all wells prior to first injection of product and at five-year intervals thereafter as nitrogen testing is the industry standard for testing gas tightness in storage caverns. Finger Lakes proposes to conduct MITs on the wells that are the subject of this Application at five-year intervals in the future, at test pressures modeled in the geomechanical study and FEA.*

All MIT testing pressures are based on a 0.8 psi hydrotest/hydrostatic pressure, and 0.75 psi nitrogen/brine pressure test as follows, respectively, and such pressures are included in the Geomechanical study that is being performed.

<u>Well No.</u>	<u>Hydrotest/Nitrogen Interface</u>
Well 33 – casing seat cemented at 1,975’-	1,580 psi/1,481 psi.
Well 43 – casing seat cemented at 2,117’-	1,694 psi/1,588 psi.
Well 44 – casing seat cemented at 2,423’-	1,938 psi/1,817 psi.
Well 58 – casing seat cemented at 2,183’-	1,746 psi/1,637 psi.

9. **Well Status and Condition Report.** The purpose of this report is to show that prior to commencement of storage operations, the condition of all wells located within and immediately adjacent to the storage area is such that storage gas containment is not compromised. Please include the following items.

- a. A well summary covering all plugged and unplugged wells which documents the well use histories and current status or downhole condition of each well.

DEC Comment: See response to below Item 9b.

Finger Lakes Response: See response to Item 9b.

- b. A proposed remediation plan for wells described in item a above which are not adequately completed or plugged to ensure storage gas containment.

DEC Comment: With respect to Items a and b above, Finger Lakes provided information on the wells in proposed storage Galleries 1 and 2 as Tab D of its storage application, and at other locations within the application. Well construction and well history information is also included on page 4 of the storage application. Please provide a well diagram showing existing casing and cement for each plugged and unplugged well in Galleries 1 and 2. The diagrams for existing and proposed plugged wells must show the location of existing or proposed mechanical and/or cement plugs in the wellbore. Information on the historical use of Gallery 2 for LPG storage is provided on page 4 of the storage application and in Exhibit 10. Details and results of the Vertilog well casing evaluation logs recently run on the wells during re-entry are provided on page 5 of the storage application. Well Nos. 33 and 44 were recently relined to ensure integrity of the storage system. Provide an explanation as to why well No. 43 does not require relining.

For proposed storage Gallery 2, Finger Lakes’ intended use of Well No. 30 is unclear. Page 2 of Tab D states “will be converted to LPG storage” while page 12 of the application states “Finger Lakes plans to replug and abandon well 30...” Please clarify.

Finger Lakes did not provide any information on wells “immediately adjacent to the storage area” as requested in Item 9. For the purpose of this requirement, immediately adjacent is defined as all wells in a cavern or gallery within 500 feet of the ultimate cavern outlines for proposed storage Galleries 1 and 2. For all identified immediately adjacent wells, provide well name, number, API No., current status, year

plugged, if-applicable, and well owner's name. For clarification sake, a tabulation of all wells (Galleries I and 2, and immediately adjacent) documenting each well's current status, proposed status and remedial or plugging work already performed or required is requested.

Finger Lakes Response: *The Well Status and Condition Report has been revised and is attached to the revised Reservoir Suitability Report. Well diagrams for all wells in Galleries 1 and 2 and wells immediately adjacent are also attached to the revised Reservoir Suitability Report.*

- c. A proposed monitoring/observation well protocol, if any, which lists proposed monitoring/observation wells, identifies their locations and describes the purpose, methodology and frequency of the planned monitoring and observation.

DEC Comment: Finger Lakes did not identify any permanent monitoring or observation wells for its proposed LPG storage facility. Please confirm that Finger Lakes will not have any dedicated monitoring or observation wells.

Finger Lakes Response: *Finger Lakes plans on utilizing wells 43 and 44 as monitoring wells and only for product movement if necessary.*

Prior to commencing any work on an existing or new well, including re-entry, drilling, conversion and plugging, the applicant must contact the Regional Minerals Manager to determine application, notification and/or permitting requirements for individual wells in accordance with 6NYCRR Parts 550-559.

10. **Storage Rights Affidavit** - Please provide an affidavit stating that the applicant has acquired at least 75% of the storage rights within the proposed storage formation in the reservoir and buffer zone, and reference and include a lease tract map. In addition to the affidavit itself, include a tabulation which corresponds to the lease tract map of the names and complete mailing addresses of all surface owners within and adjacent to the proposed storage area (reservoir and buffer zone).

DEC Comment: Finger Lakes did not provide the requested lease tract map and tabulation. Finger Lakes must provide a new affidavit, lease tract map (including ultimate cavern outlines) and tabulation.

Finger Lakes Response: *A storage rights affidavit, storage rights tabulation, and storage rights map is attached as Exhibit E.*

Other Comments/Questions

Page 1, 1st paragraph – The statement “US Salt has been in the business of salt production for over 100 years by solution salt mining underground salt deposits on property adjacent to Seneca Lake” is incorrect as written. The sentence should be revised to state “US Salt and its predecessors at the facility....” US Salt’s predecessors at the facility include Cargill, Akzo-Nobel, Akzo and International Salt.

Finger Lakes Response: *This has been corrected in the Reservoir Suitability Report.*

Page 2, 5th paragraph – Finger Lakes states “Brine circulated from the caverns will be stored in one or more above-ground ponds.” Please clarify the location of the multiple ponds that may be used to store brine.

Finger Lakes Response: *There will be one (1) brine pond. This has been clarified in the revised Reservoir Suitability Report.*

Page 4, 2nd full paragraph – Finger Lakes states “The wells were abandoned in 1986 then the storage contract terminated with TEPPCO since they required a larger volume of storage than what US Salt was willing to provide” is incorrect as written. US Salt did not own the subject facility in 1986. The sentence should be revised to state “...than what one of US Salt’s predecessors at the facility was willing to provide.”

Finger Lakes Response: *The sentence has been corrected in the revised Reservoir Suitability Report.*

Page 4, 4th full paragraph - Finger Lakes states “When wells 33, 34, 43 and 44 at the US Salt facility at Watkins Glen were drilled out and reopened, there was positive pressure held on the cavern since abandonment indicating the 4-well gallery retained mechanical integrity.” What were the positive pressures encountered?

Finger Lakes Response: *See revised Section 5 of the Reservoir Suitability Report.*

Page 5, 2nd paragraph – Finger Lakes states “NYSEG performed a hydrotest on Gallery 2 and Inergy has reviewed the MIT and the entire Gallery had pressure integrity.” Please provide a copy of the referenced hydrotest of Gallery 2 performed by NYSEG. A recent long-term brine hydrotest for Gallery 1 was performed in May 2009, and the results are provided as Exhibit 7 of the storage application. It is understood that Finger Lakes will have performed or will perform a nitrogen/brine interface MIT on every storage well (injection and withdrawal) prior to the injection of any storage gas.

Finger Lakes Response: *This statement referred to the hydrotest on the previously designated Gallery 2 (i.e., the one currently controlled by NYSEG and submitted in Finger Lakes’ initial application). Testing of the current Gallery 2 (well 58) has been performed and the results provided with the revised Reservoir Suitability Report.*

Page 5, 3rd full paragraph – Finger Lakes states “These tools are important to the operation of the reservoir since repetitive and comparative logs will alert Finger Lakes to any changes that might affect the well and cavern operation.” What is Finger Lakes schedule for running comparative gamma ray and neutron logs?

Finger Lakes Response: *Finger Lakes will run comparative gamma ray and neutron logs at the same time sonars are performed.*

Page 5, last full paragraph – Finger Lakes states “Finger Lakes and Inergy are cognizant of the overall pressures required for safe operations of hydrocarbon storage caverns based

on years of experience and will never permit leakage that would jeopardize the public or USDW.” At what frequency will Finger Lakes monitor the wellhead pressures of its storage wells to ensure safe operation of its facility? It is understood that Finger Lakes Emergency Response Manual will be provided at a later date per above Item 6h.

Finger Lakes Response: *Finger Lakes’ operations manual will specify that wellhead pressures are monitored on a daily basis.*

Page 6, 1st full paragraph – Finger Lakes states “The actual extent of the cavern...is based on the hydrostatic testing that took place.” Please elaborate and explain this statement.

Finger Lakes Response: *This sentence has been deleted in the revised Reservoir Suitability Report.*

Page 6, 2nd full paragraph – Finger Lakes states “Hydrostatic pressure testing at a gradient of 0.8 psi/foot was performed by injection of nearly saturated brine into well 43 to determine the integrity of the casings and cavern to fluid movement within or out of the gallery.” Pressure test data is included as Exhibit 7. Please provide and show calculation for determining that pressure test was equivalent to a 0.8 psi/foot test. From Exhibit 7 pressure test data, it appears Well Nos. 33 & 43 were drilled out to the cavern and open to the pressure test and Well Nos. 34 & 44 remained plugged-was this the status of the wells during the Gallery 1 test?

Finger Lakes Response: *See attached as Exhibit F is a further description of the pressure test. During the pressure test, wells 34 and 44 remained plugged.*

Page 6, 3rd full paragraph – Finger Lakes states “New sonars of caverns for the proposed Finger Lakes Gallery 1 showed the salt pillar thickness relationship...” Information on the existing salt pillar thicknesses is important. However, Finger Lakes neglected to include information on salt pillar thicknesses at the end of the life of the project (i.e., ultimate cavern dimensions for Galleries 1 and 2). As previously noted, this information must be included and analyzed as part of Finger Lakes application.

Finger Lakes Response: *Salt pillar thicknesses are shown on the revised maps being submitted with the revised Reservoir Suitability Report.*

Page 11, last full paragraph – There appears to be a typo or missing word in the sentence containing “...and used for hydrocarbon storage.”

Finger Lakes Response: *This has been corrected.*

Page 14, 1st paragraph – Finger Lakes states “State-of-the art hydrotesting has been performed on the gallery shown as Finger Lakes Gallery 1 (33, 43, 34 and 44). The same will be provided for Finger Lakes Gallery 2 (30, 31 and 45) when all well workovers and new drilling are completed.” It is the Department’s understanding that no wells in Gallery 2 will have workovers (see “Finger Lakes Gallery 2,” page 12 of application). Please clarify. In addition, if and when the storage permit is issued and prior to injection of

product, Finger Lakes will be required to submit for Department review and approval test data and a narrative report detailing the results of the proposed Gallery 2 hydrotesting.

Finger Lakes Response: *The wells included in Gallery 2 have changed from the gallery currently owned by NYSEG and containing wells 30, 31 and 45 to well 58 (currently owned by US Salt, LLC and to be transferred to Finger Lakes). There has been a long term pressure test for Well 58. See Sections 5 and 6.2 of the revised Reservoir Suitability Report.*

Exhibit 15, Mechanical Integrity Test Procedures – Finger Lakes states “The U.S. Environmental Protection Agency (USEPA) requires that storage wells undergo a mechanical integrity test (MIT) prior to fluid injection in order to assure protection of the underground source of drinking water (USDW).” For clarification sake, the USEPA does not regulate LPG storage wells where no active solution mining is occurring such as Finger Lakes’ proposal. Wells used for the injection of LPG are specifically excluded under the USEPA’s Underground Injection Control (UIC) Program. See CFR Part 144 which states “(2) Specific exclusions. The following are not covered by these regulations: (iv) Injection wells used for injection of hydrocarbons which are of pipeline quality and are gases at standard temperature and pressure for the purpose of storage.” (<http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=e836eb638bc78ea602d31da7d5dca6dc&rgn=div8&view=text¬e=40:22.0.1.1.6.1.35.1&idno=40>). While the USEPA can require a “gas” MIT for Class 3 solution mining wells, its standard test uses brine which is not satisfactory to the Department for underground gas storage MIT purposes. Nevertheless, the Department appreciates Finger Lakes’ intent that all storage wells will be tested prior to storage service, and the fact that Finger Lakes states elsewhere in its application that all storage wells in Galleries 1 and 2 will be tested using the nitrogen/brine interface test prior to product storage.

Finger Lakes Response: *The MIT Procedures have been revised to reflect the Department’s comments and these are included with the revised Reservoir Suitability Report.*

EXHIBITS TO RESPONSE TO NOIA

- Exhibit A – Application to Transfer Wells in Galleries 1 and 2 to Finger Lakes
- Exhibit B – Revised EAF
- Exhibit C – List of sonars for each well within Galleries 1 and 2 and the other wells in the immediate vicinity
- Exhibit D- SOCON Letter dated April 5, 2010
- Exhibit E – Storage Rights Affidavit, Storage Rights Tabulation, and Storage Rights Map
- Exhibit F – Summary of Hydrotesting for Gallery 1